

ABSTRACT OF THE DISCLOSURE

5 A quantizer adapted for use with a delta-sigma analog-to-digital converter. The quantizer includes first and second comparators adapted to compare an input analog signal to a threshold and provide a digital output in response thereto. First and second thresholds are provided to the first and second comparators respectively. In accordance with the present teachings, a mechanism is provided for changing the thresholds to minimize conversion errors. While the mechanism for changing the thresholds may be implemented with resistive and/or capacitive ladders, in the illustrative embodiment, digital-to-analog converters are utilized. The DACs are driven by error shaping logic. The inventive quantizer allows for an improved delta-sigma analog-to-digital converter design which combines an ADC and a DAC. The DAC reconstructs the analog equivalent of the digital output of the ADC. The ADC is a flash converter consisting of one comparator per threshold. The DAC operates by summing the outputs of a set of nominally identical unit elements. The DAC has the same number of elements as there are comparators in the flash ADC and each comparator drives one element of the DAC. A novel feature is that the thresholds of the comparators in the ADC can individually be dynamically adjusted, so that the correspondence between an element of the DAC and a particular threshold of the ADC can be varied from sample to sample under the control of logic circuitry. This arrangement allows the correspondence between DAC elements and ADC thresholds to be remapped without introducing any additional delay into the signal path between the ADC and the DAC. In a high speed continuous-time delta sigma modulator, this allows randomization or shaping of the mismatch errors of the DAC elements to be achieved without incurring any penalty in sample rate, nor adding any excess delay into the loop that might destabilize or otherwise degrade the operation of the modulator.

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